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Production in the USSR of Dry Standard Biological Preparations
in Refrigerated Vacuum Chambers

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PRODUCTION IN THE USSR OF DRY STANDARD
BIOLOGICAL PREPARATIONS IN REFRIGERATED VACUUM CHAMBERS

Preservation of therapeutic, prophylactic, and diagnostic biological preparation by drying is one of the newest ⁶problems of medical and veterinary ⁶professions. ⁶problems.

Measures aimed at improvement of drying equipment and increase of its output as well as ^{improvement of}enhancing the properties of dry therapeutic biological preparations arouse the keenest interest among physicians and veterinaries. At present the ^{preparation}provision of dry biological preparations is the task of a number of medical and veterinary institutes and biological factories in the USSR, where the drying technique is being continuously developed and equipment is being improved.

Foreign scientists endeavor to credit American science with precedence in the ^{field}area of production and research relating to dry biological preparations, and individual firms propagandize the novelty of American medical drying equipment. Actually, however, historical data and facts of recent years convincingly establish the precedence of the Soviet Union in the promotion of ideas and the development of methods in manufacturing-scale drying of therapeutical biological preparations. ^{on a production scale}Intensive study of mass production problems of dry medical and veterinary biological preparations and design of drying equipment was begun at the Leningrad Scientific Research institutes as far back as 1934 (6, 7, 8, 9).

In 1935 the Americans utilized the procedure of drying frozen biological preparations in vacuum. This procedure bears the designation of "sublimation."

In order to apply this procedure,

~~In its embodiment~~ Flosdorf and Mudd have proposed a vacuum collector device (14) for the so-called "lyophilic" dessication of frozen immunization sera and other biological preparations.

Research work on drying conducted by us during 1935 -- 1938 at the Leningrad Institute of Vaccines and Sera and the Institute of Labor Hygiene has shown the obvious inconvenience and impracticability of using lyophilic collector apparatus in manufacturing production of veterinary and medical dry biological preparations. As a result of this, in 1937 we proposed, and in 1938 we installed together with M. A. Kalashnikov and L. G. Bogomolova at the Leningrad Institute of Blood Transfusion the first, in the USSR, lyophilic apparatus of a chamber design, which is more economical in mass production of standard dry biological preparation than the collector type. Drying of frozen biological preparations is effected in a chamber vacuum apparatus by absorption of vapors in a condenser at low temperatures (2, 7, 8).

Use of metal vacuum chambers with auxiliary cooling made it possible for us as early as 1938 not only to increase the output of a lyophilic drying chamber apparatus, but also to attain in the vacuum drying of frozen serum and plasma a maximum dosage reaching up to 400 milliliters in $\frac{1}{2}$ liter glass flasks (11).

Just one year later, i.e., 1939, a lyophilic vacuum chamber apparatus of Greaves and Adair (16) was installed at Cambridge for

the drying, without auxiliary cooling of the drying chamber, of standard antitetanus serum. Considerably later (1943 - 1946) a number of American enterprises began the construction of variously-designed lyophilic vacuum chamber apparatuses for the drying of sera, plasma, and other biological preparations. American chamber apparatuses were advertised and urged upon foreign countries during the war (3, 1, 5, 12, 13, 17).

Subsequently Flosdorf and Mudd have proposed, for laboratory work on drying of cultures and vaccines, a cryochemical vacuum collector apparatus (15). This collector apparatus is most inconvenient in operation and does not permit attaining a uniform drying of biological preparations. It is based on the process of absorption of vapors from frozen biological preparations by calcinated granular gypsum under vacuum.

While working on improvement of a cryochemical collector drying apparatus we proposed in 1948 and put into operation at the Central State Scientific Control Institute of the Ministry of Health USSR, in collaboration with S. I. Didenko, a more convenient portable laboratory scale cryochemical vacuum chamber apparatus (with auxiliary cooling) for the drying of vaccines and cultures. This apparatus (see drawing) makes it possible to attain save, high quality dessication in ampules of pathogenic bacterial cultures and vaccines in small lots. A characteristic of our apparatus is a uniform drying and production of dry standard preparations with low residual moisture content.

From the foregoing it is apparent that Soviet researchers were the first in propounding the idea and embodying it in practice

the principle of lyophilic chamber and cryochemical vacuum drying of standard therapeutic veterinary and medical biological preparations in large and small lots on a manufacturing scale.

Drawing. ⁹Diagram of the laboratory scale cryochemical chamber vacuum apparatus designed by N. N. Titov and S. I. Didenko.

1. Small metallic vacuum tank. 2. Calcinated granular gypsum.
3. Drying chamber. 4. Hermetic lid. 5. Metallic bath holding the cooling mixture. 6. Thermometer. 7. Rubber connection tube.

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